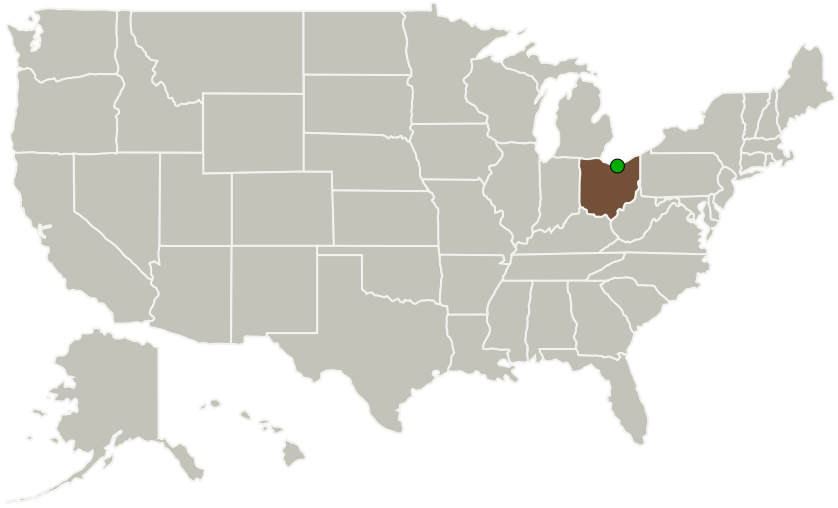
Advanced Analytical Tools for the Characterization of Fundamental Jet Noise Sources and Structures, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

There is a need for innovative technologies and methods for noise reduction, noise prediction, and noise diagnostics. A comprehensive approach to reducing noise from any flow is predicated on a clear understanding of noise sources, i.e., the turbulent flow itself. Although much has been discovered in the last several decades about the connection between turbulence and noise, the heuristic element of the analysis has prevented the development of breakthrough noise mitigation technologies. For example, it is known that larger structures are responsible for shallow-angle noise, and the formation of shocks at supersonic speeds results in a new mechanism of noise production due to the passage of turbulent structures, However, the precise mechanism by which this transformation occurs is not known. High-fidelity datasets that capture the above phenomena whether from simulation or experiment are increasingly accessible, and need to be harnessed in better ways. With this in mind, analytical tools must be used and developed to extract the most useful information from the data. Tool such as Proper Orthogonal Decomposition, Stochastic estimation, Wavelet decomposition, Empirical Mode Decomposition, Dynamical Mode Decomposition and Doak?s decomposition have been shown to be useful for extracting such information. At present however, different practitioners use these tools differently, which makes the task of assimilating the data very difficult. The goal of the present effort is to develop a user-friendly software suite that unifies these advanced techniques to provide a standard approach. The development will be integrated with testing by exploring noise sources in ongoing experimental and computational rectangular and an axisymmetric multi-stream jet campaigns.

Primary U.S. Work Locations and Key Partners



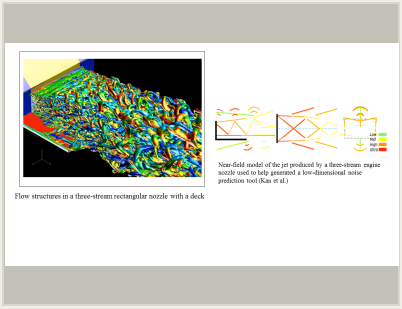


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

Advanced Analytical Tools for the Characterization of Fundamental Jet Noise Sources and Structures, Phase I

Completed Technology Project (2016 - 2016)

Organizations Performing Work	Role	Type	Location
Spectral Energies, LLC	Lead Organization	Industry Small Disadvantaged Business (SDB)	Dayton, Ohio
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations
Ohio

Project Transitions

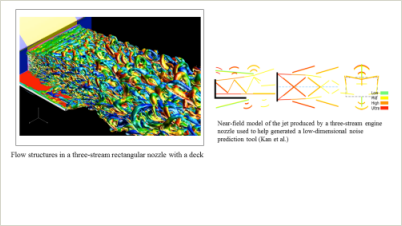
June 2016: Project Start

December 2016: Closed out

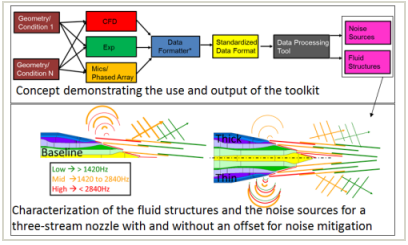
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139580)*

Images



Briefing Chart Image
Advanced Analytical Tools for the Characterization of Fundamental Jet Noise Sources and Structures, Phase I
(https://techport.nasa.gov/image/129472)



Final Summary Chart Image
Advanced Analytical Tools for the Characterization of Fundamental Jet Noise Sources and Structures, Phase I Project Image
(https://techport.nasa.gov/image/128017)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Spectral Energies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

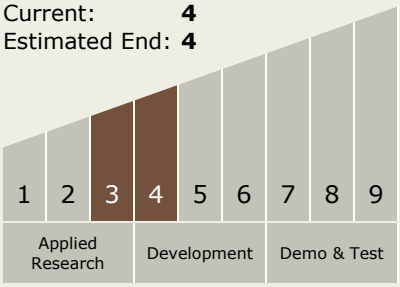
Carlos Torrez

Principal Investigator:

Sivaram P Gogineni

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Advanced Analytical Tools for the Characterization of Fundamental Jet Noise Sources and Structures, Phase I

Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System